

### 3.4.4 The Breathing System in the Human

Objectives – What you will need to know from this section

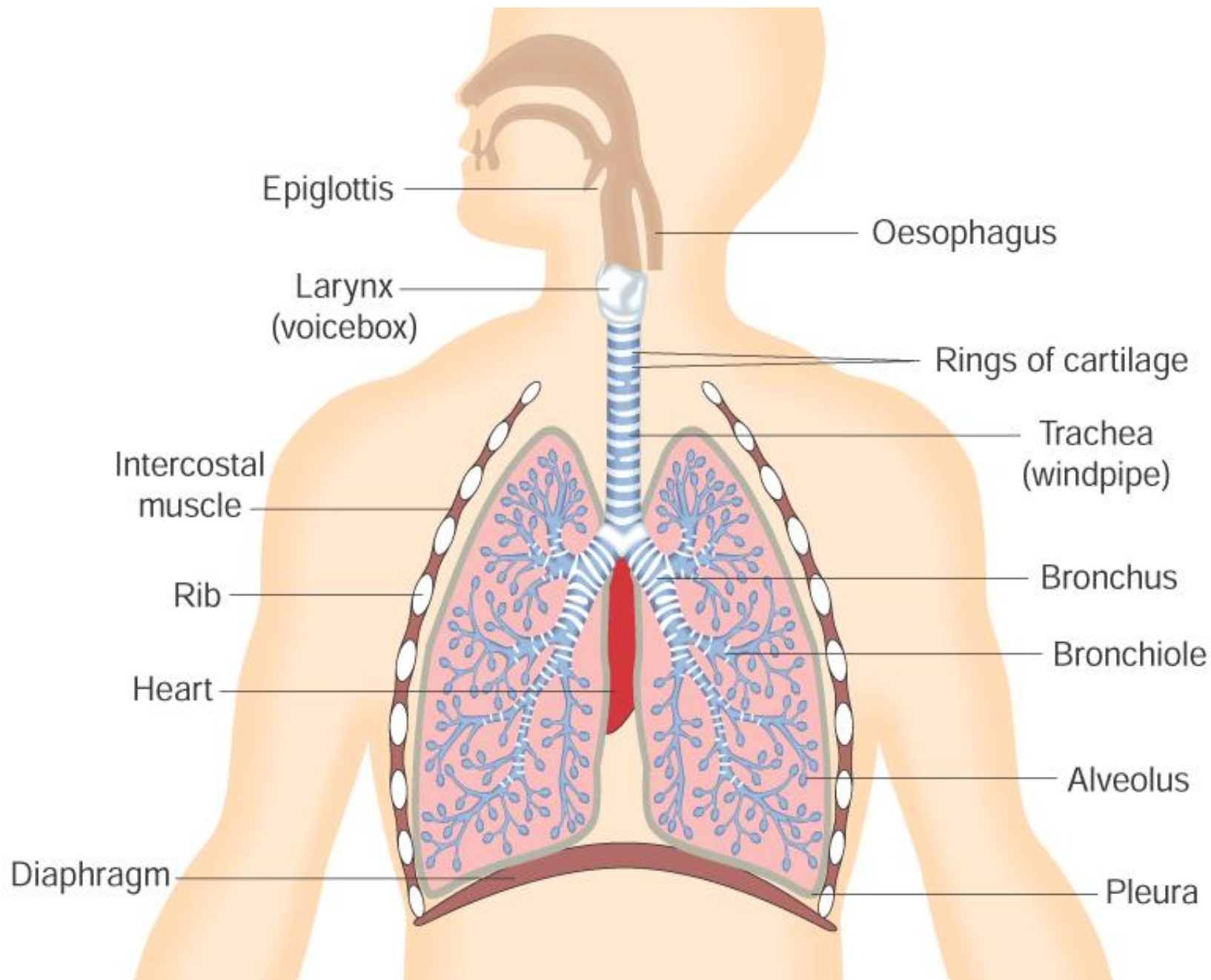
- Outline the macrostructure & function of the breathing tract in humans.
- Outline the essential features of the alveoli & capillaries (as surface) for gas exchange.
- Describe the mechanism of the breathing system in gas exchange .
- Outline a breathing disorder:  
Cause/prevention/treatment (Asthma/Bronchitis)

### 3.4.4 The Breathing System in the Human

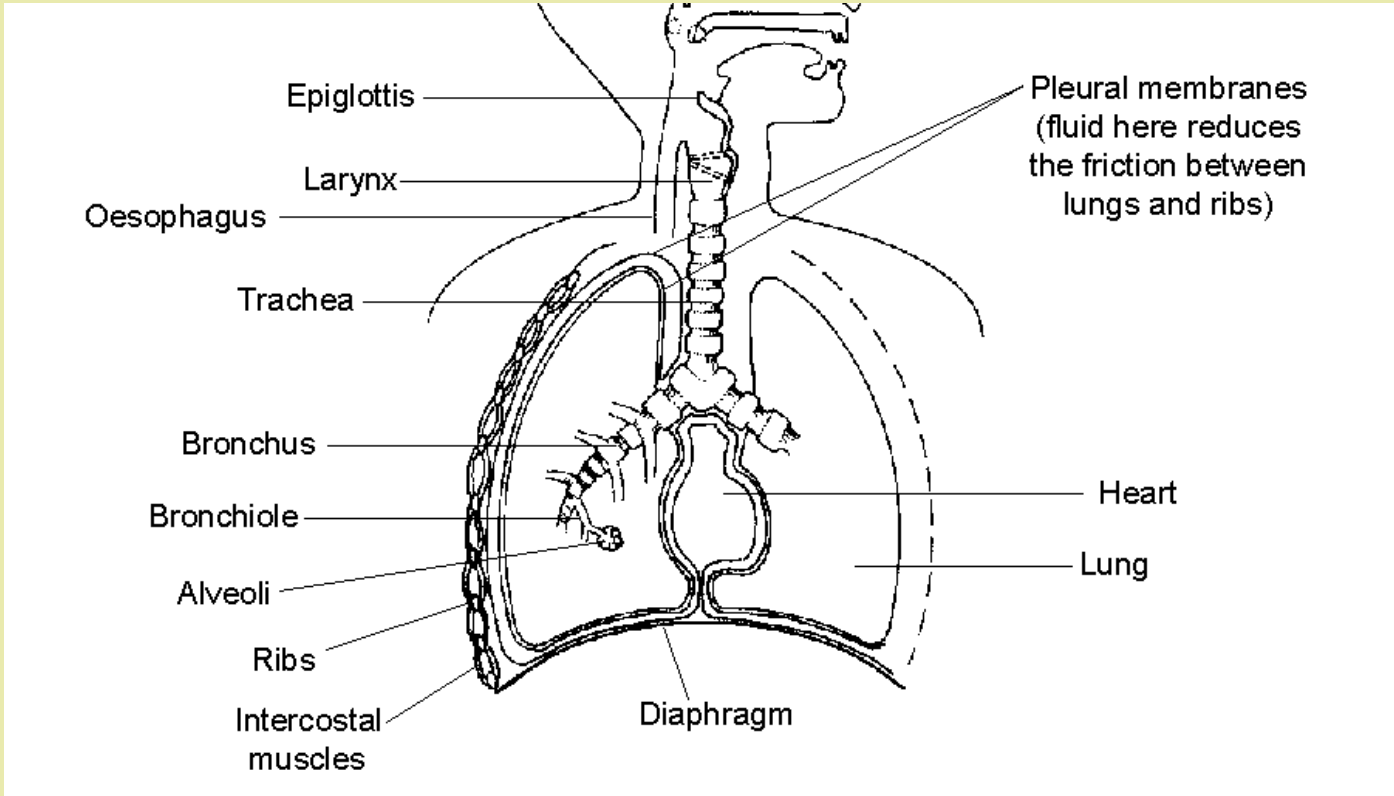
- **Respiration**-We get our energy for metabolism by burning food in our cells
- **Breathing**-We get fresh supplies of oxygen by breathing it in through our lungs.

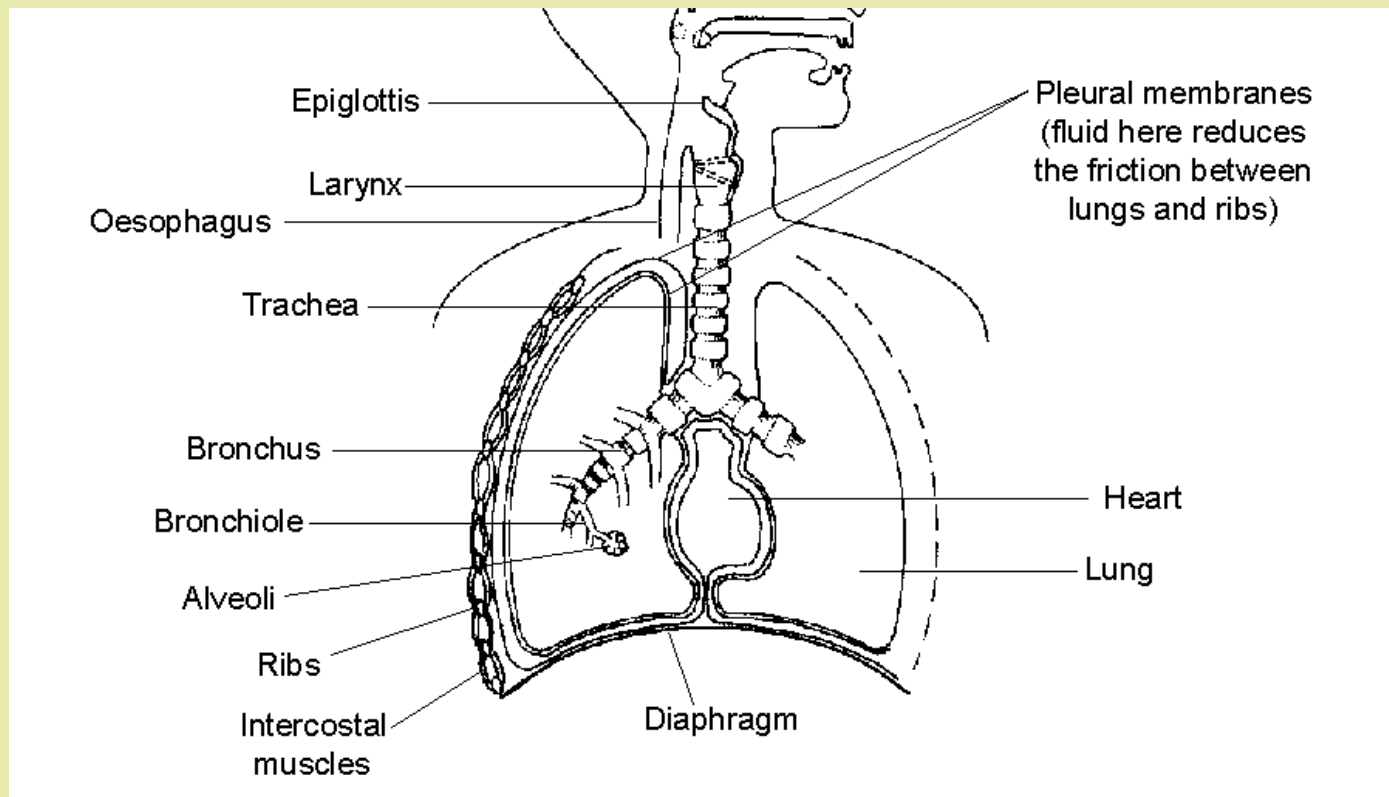


# RESPIRATORY [LUNG] SYSTEM



- Your lungs are enclosed (along with the heart) between the ribs and the diaphragm [the thorax]
- The ribs form a protective cage of twelve pairs of bones.



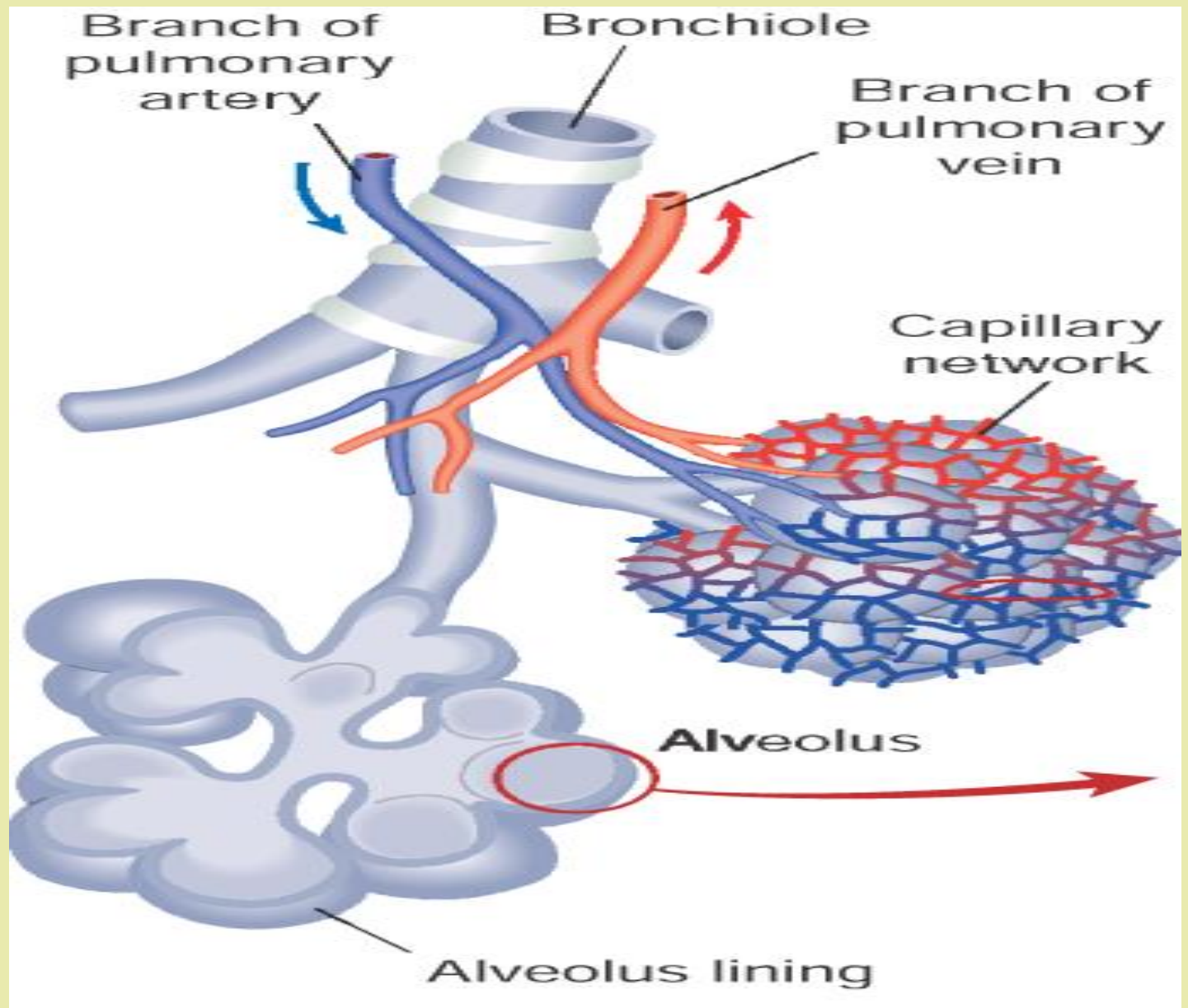


- Intercostal muscles, attached between the ribs, move the rib cage up or down.
- The diaphragm is a sheet of muscle at the base of the rib cage.

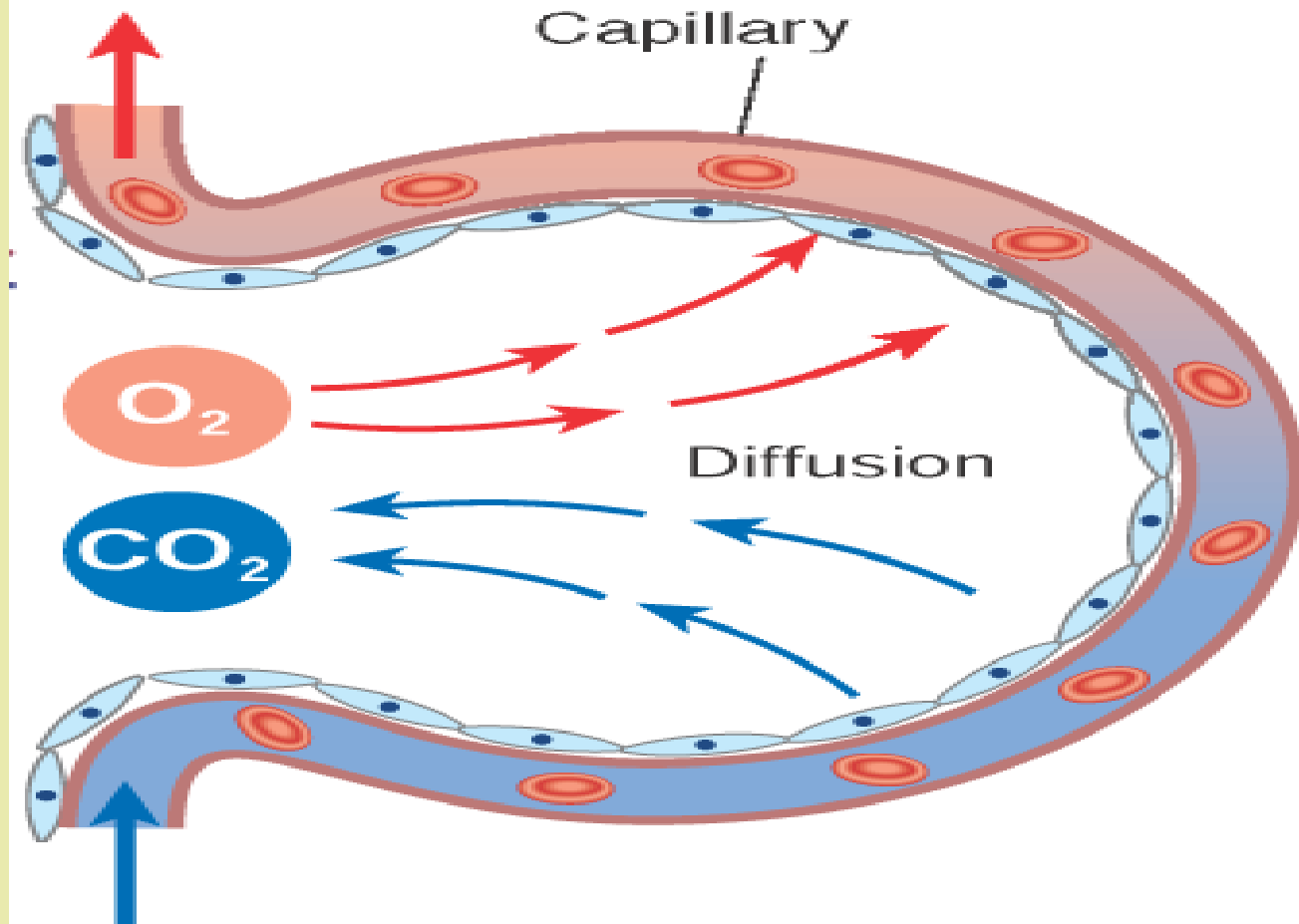
# LEARNING CHECK

- What is metabolism?
- What is respiration?
- Your lungs are enclosed by what parts of the body?
- What is the function of your ribs?
- What is your diaphragm?





## ALVEOLUS STRUCTURE



**Diffusion** is the movement of molecules from a region of high concentration to a region of lower concentration



## **Protection**

- The lining cells of the nose, trachea and bronchi produce a sticky mucus that traps dust and germs.
- White blood cells in the alveoli can engulf bacteria and foreign matter.

# Adaptations of the Lungs for Gas Exchange

- Alveoli have a large surface area [90m<sup>2</sup>]
- Short distance between air and blood
- Complete involvement of air and blood
- Walls of alveoli are elastic

## COMPOSITION OF AIR IN THE LUNGS

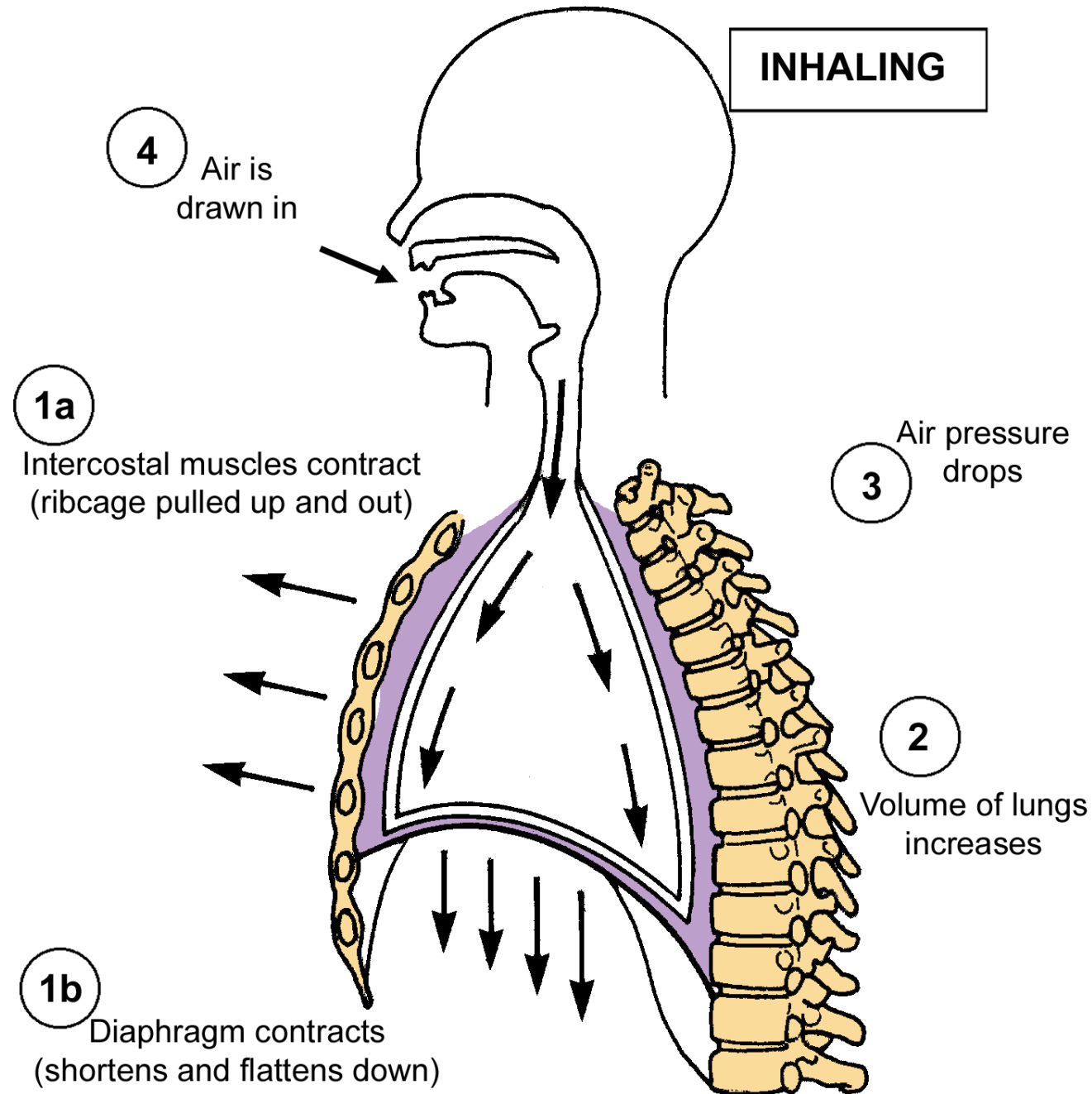
	% Volume	
	Inhaled air	Exhaled air
Oxygen	21	16
Carbon dioxide	0.04	4
Nitrogen	79	79
Water vapour	Varies	Saturated

# LEARNING CHECK

- List the pathway of air from our nose to alveolus.
- How is the alveolus adapted to gas exchange?
- Explain the differences between inhaled and exhaled air.
- How are the lungs protected against infection?

# INHALING [INSPIRATION]

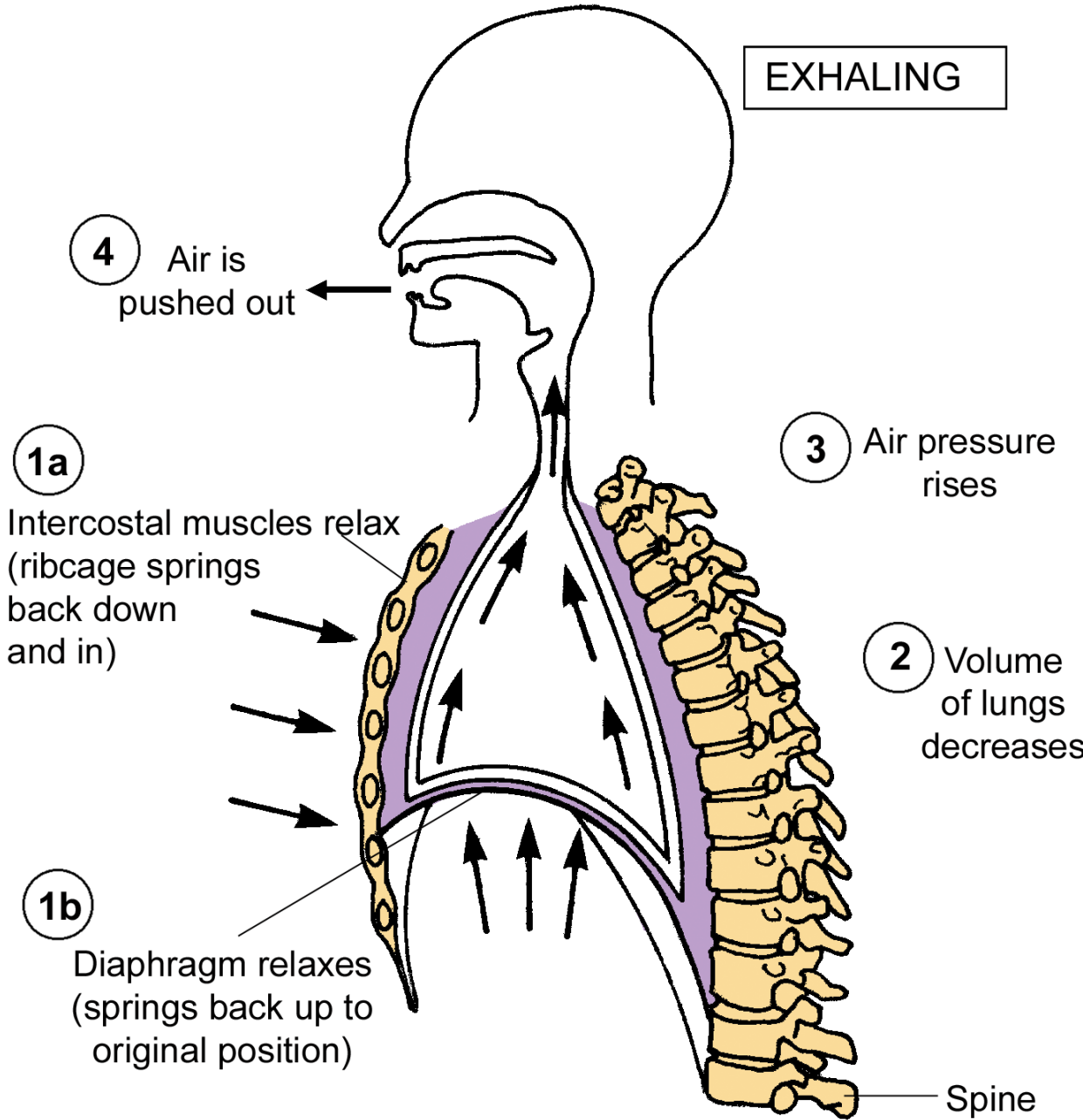
➤ Inhaling  
means  
breathing in.



- 1) The brain sends signals to the rib muscles and diaphragm to contract
- 2) The ribs are pulled up and out, and the diaphragm flattens downwards
- 3) the volume of the chest increases,
- 4) so air pressure drops and more air is drawn into the lungs and alveoli.

# EXHALING [Expiration]

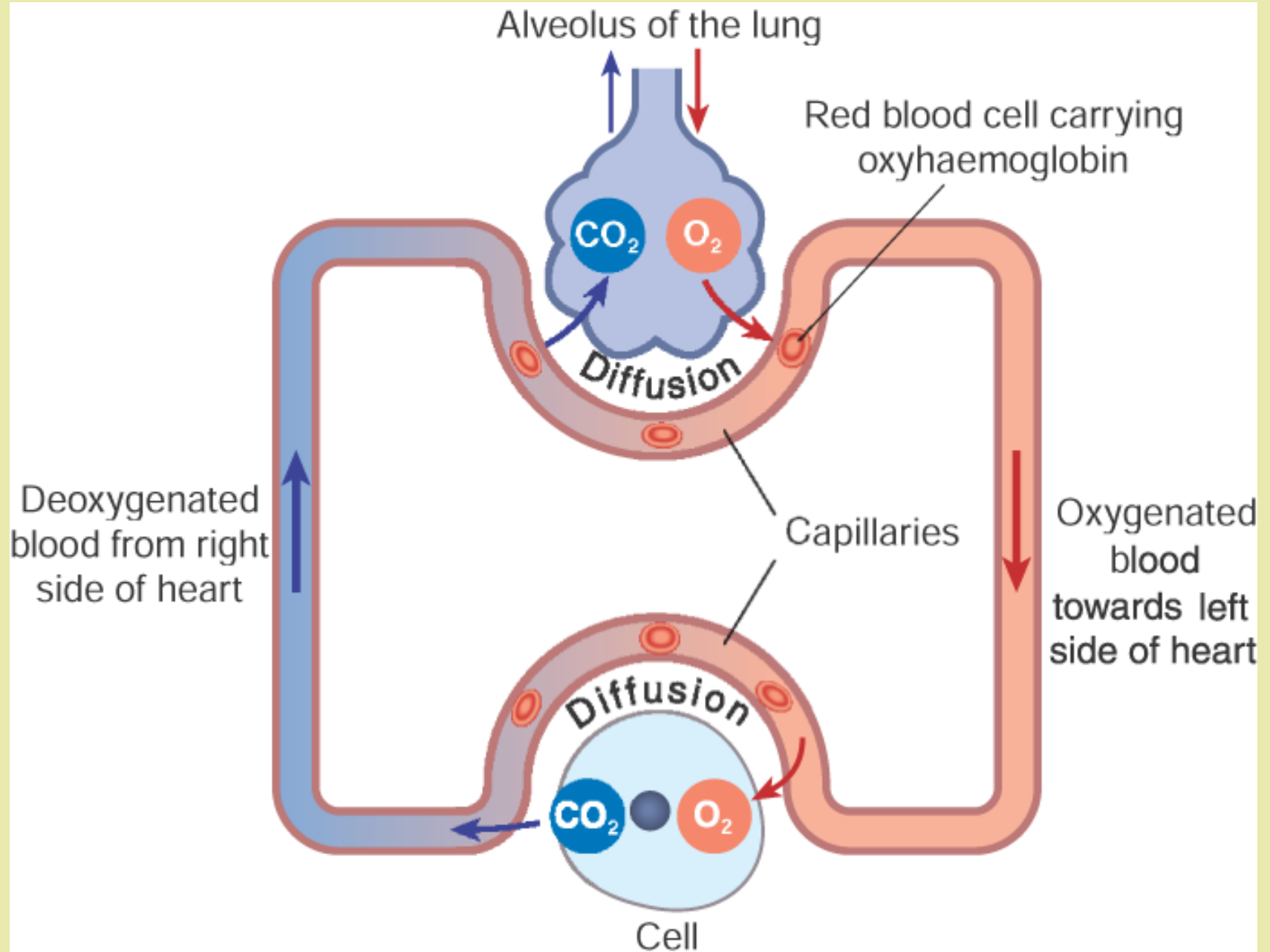
➤ Exhaling means breathing out





- 1) The rib muscles and diaphragm relax, springing back to their original positions,
- 2) Air pressure in the lungs increases, and air is pushed out from alveoli.

# GAS EXCHANGE IN THE LUNGS & TISSUES



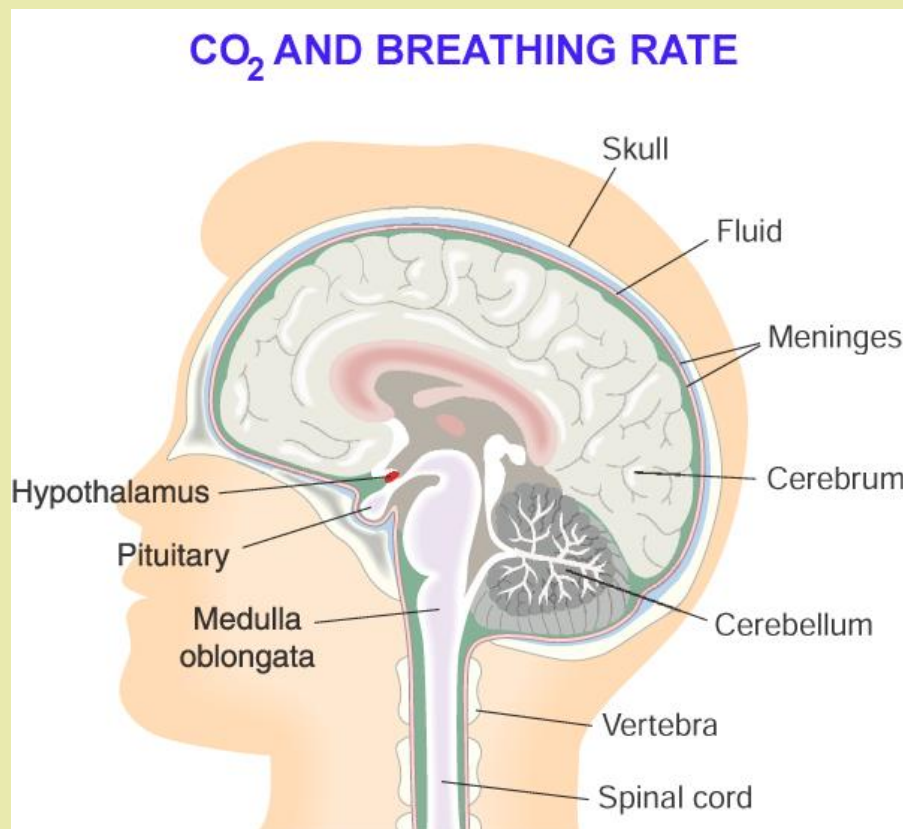
# LEARNING CHECK

- Name the two sets of muscles involved in inhalation.
- List the steps involved in inhaling air.
- What happens the oxygen absorbed into the blood?
- Where does the extra  $\text{CO}_2$  in the blood come from?
- What does oxygeneated blood mean?

- Our voice box (larynx), is made of two sheets of muscle that vibrate as the air passes between them and so we can produce sounds and speech, in co-operation with our tongue, mouth and teeth.

## CONTROL OF BREATHING

- We breathe automatically by involuntary reflex action. It is controlled by medulla oblongata of the brain.



- The rate of breathing is continually adjusted to meet the body's needs (an example of homeostasis).

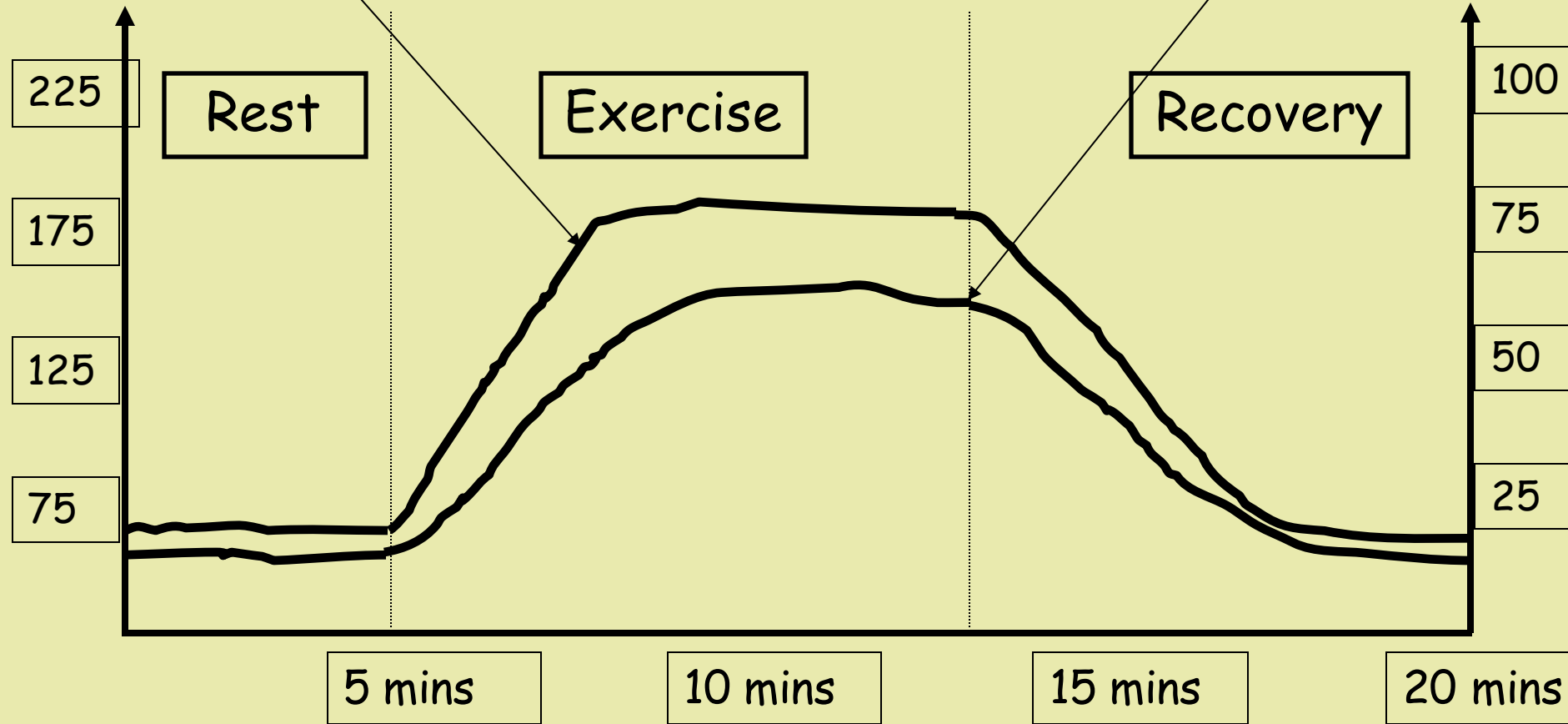
# Role of the Brain in Breathing

- Mostly breathing rhythm is unconsciously set by the brain
- We can voluntarily change the rate at which we breath
- You can't hold your breath forever
- Your brain won't let you

# The Effect of Exercise

Heart rate/min

Breathing rate/min



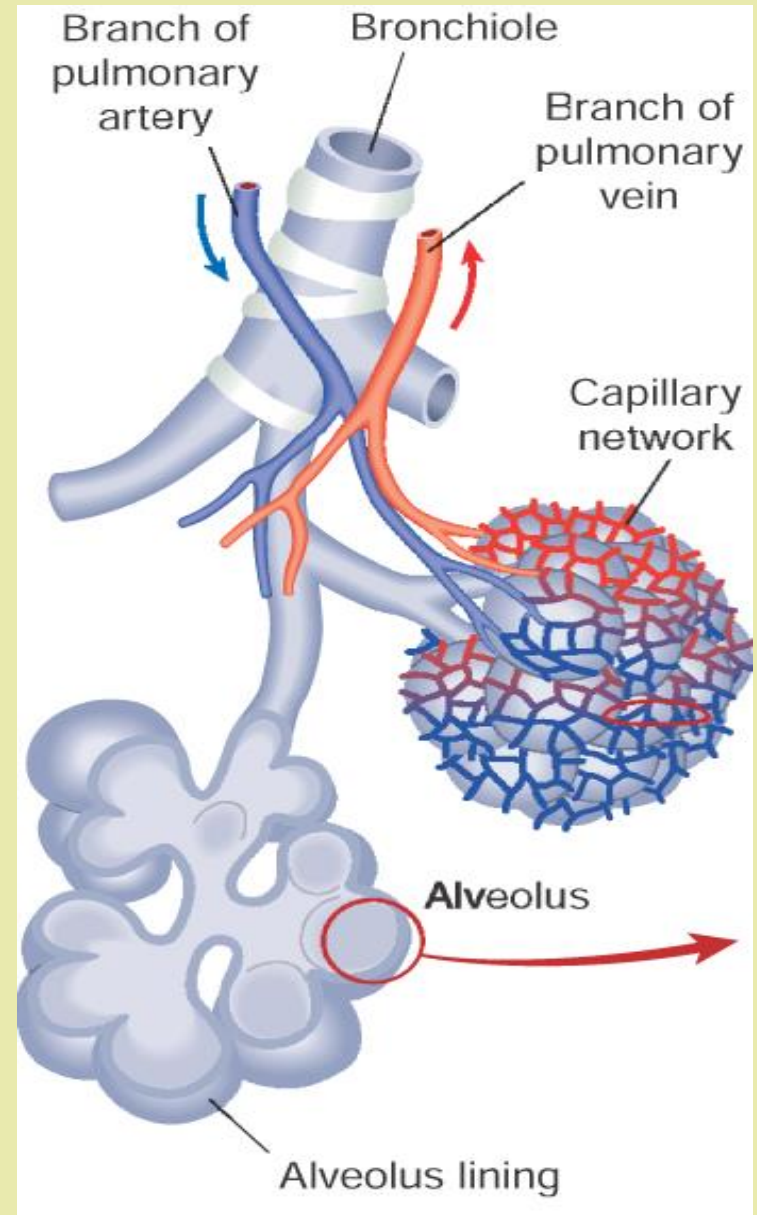
# Breathing Disorders

- Asthma – inflammation & constriction of bronchi



# ASTHMA

➤ Asthma is a narrowing of the bronchioles due to some irritant and so the sufferer finds it difficult to inhale enough oxygen.



## Asthma symptoms

- Coughing
- Wheezing
- Breathlessness
- Chest tightness

## Asthma: Causes

- Pollen
- Animals
- Smoke
- Dust mites
- Chemicals
- Exercise

# Asthma -- Prevention and Treatment

- Identify triggers
  - avoid or remove
- Use specific drug treatments
  - Bronchodilators
  - Steroids



# LEARNING CHECK

- What role does the brain play in breathing?
- What happens your breathing rate when you exercise?
- What advantage is this for you?
- Name a disorder of the breathing system.
- What are its symptoms?
- What are its Causes?
- What are its Treatments?